

INTEGRATING TECHNOLOGY



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Subject: Stages of Technology Integration, Planning, Training, Scheduling, Collaborative Learning, Mentoring

Grade Level: All

Technology: Conferencing or collaborative work software, Internet/Web, e-mail, simulation software, word processors, databases, spreadsheets, computer-assisted-instruction software, graphics programs, hypermedia programs, videodiscs, scanners

Educators talk a lot about technology integration.

But, what is it? Where does it happen?

What barriers might educators encounter?

And, what are the stages of technology integration?

Some Things You Should Know

Technology has been present in K–12 classrooms across the United States for more than a decade. One of the major concerns about using technology in education is teacher training, specifically, moving teachers away from using computers for drill-and-practice toward a more integrated approach.

Teachers are bombarded with the notion that computers should be an integral part of their classroom activities. A fundamental challenge for many teachers is using computers to create innovative learning opportunities for students. Far too many teachers receive little or no training. Some of the lucky ones attend training on using computer hardware and software. A few more fortunate teachers are trained to integrate technology. As an instructional technology specialist, I find that four common questions are typically not raised or answered as schools begin to implement their instructional technology.

1. What is technology integration, and what isn't it?
2. Where does technology integration happen?
3. What are the barriers to technology integration?
4. What are the stages of technology integration?

These questions could affect the way teachers see technology integration, use computers, and embrace the changes that occur as technology is placed in their classrooms.

What Is Technology Integration, and What Isn't It?

A common misconception is that educators know the answer to this question. Teachers are often expected to integrate technology without having a working definition of the concept. Morton (1996) suggests that technology integration is *not* simply seeing the computer as a "tool." He argues that using this view promotes the notion of the "computer as add-on." It misleads educational planners by implying that computer technology is like any other tool, such as the blackboard or overhead, which may require little or no training and may not even need to be used. In addition, "computer as tool" enables curriculum developers to continue implementing traditional, subject-based, teacher-directed instructional plans where "the computer environment remains peripheral, an 'add-on' in space and time" (Morton, p. 417). In other words, taking the students to the computer lab once a week for 40 minutes is not necessarily integration, and neither is using the computer as an electronic worksheet or reward station for students who are finished with their other assignments.

Instead, technology is integrated when it is used in a seamless manner to support and extend curriculum objectives and to engage students in meaningful learning. It is not something one does separately; it is part of the daily activities taking place in the

classroom. For example, if I finish instruction on geometric shapes and want students to demonstrate their understanding of the concepts covered, I might have them use a digital camera to take pictures of geometric shapes around the school. Then I'll ask them to compose a multimedia slideshow explaining each shape. The primary goal is not to use the technology; rather, the goals are to engage students in meaningful learning and assess their understanding of geometric shapes. Technology enriches the activity and enables students to demonstrate what they know in new and creative ways.

Where Does Technology Integration Happen?

Technology integration does not happen in a particular location but in a specific type of learning environment. To construct an environment ripe for integration, we must think differently about teaching and learning. Many think that technology integration is most likely to occur in learner-centered classrooms in which the teacher acts as a facilitator. According to Jonassen (1995), this type of environment has seven aspects that make learning meaningful. The learning environment is:

- *Active.* Students participate in mindful processing of information. They are responsible for the results and may use the computer as either a cognitive or productivity tool to achieve those results.

The most common barriers to technology integration include time, training, resources, and support. Teachers need time to learn how to use both the hardware and software, time to plan, and time to collaborate with other teachers.

- *Constructive.* Students integrate new ideas into their prior knowledge to make sense or meaning. They use computers as cognitive tools or to produce student media.
- *Collaborative.* Students work in learning communities in which each member contributes to the group's goals, and they work to maximize each other's learning. Using computers for conferencing or using software that supports cooperative work can facilitate collaboration.
- *Intentional.* Students are trying to achieve cognitive goals and objectives. Computers allow students to develop activity organizers and use software that supports the goals and objectives they are trying to accomplish.
- *Conversational.* Students benefit from being part of knowledge-building communities in which learners exchange ideas and build on each other's knowledge. The Internet, e-mail, and videoconferencing extend the learning community beyond the physical walls of the classroom.

- *Contextualized.* Students encounter learning assignments that are situated in real-world tasks or simulated through problem-based activities. Simulation software can reconstruct scenarios for student analysis.
- *Reflective.* Students reflect on the processes completed and the decisions made during the learning activity and articulate what they have learned. As a result, students may use computers as cognitive tools to demonstrate what they know.

What Are the Barriers to Technology Integration?

For teachers to make technology integral to their teaching, they and their administrators must understand common barriers to technology integration. In particular, they need to be prepared for the changes caused by technology integration.

The most common barriers include time, training, resources, and support. Teachers need time to learn how to use both the hardware and software, time to plan, and time to collaborate with other teachers. Training is also a concern. Some educators do not have local training options available or the time to attend training. Lack of resources also presents a problem. Without computers in the classroom and appropriate software to support the curriculum, integration can not take place. Support is critical as well. Lack of leadership, financial support, or an on-site technology expert sends many integration efforts into a tailspin.

One barrier often ignored is change. When teachers are asked to integrate technology, they are really being asked

to change in two ways. First, they are asked to adopt new teaching tools such as the computer and the Internet. These are vastly different from the classroom tools many currently use such as the chalkboard, overhead projector, or television. Second, teachers are asked to change the way they teach their students, which may include changing the role they play in the classroom and the way their classrooms are physically arranged.

For the past decade, educators have been grappling with technology and integration models. The dissemination of hardware, software, and integration training has been slow. Rogers' (1995) diffusion of innovation theory explains the process of adapting innovations such as computers and new teaching strategies. He defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas" (Rogers, p. 5). An innovation, which can be an idea, concept, or object, is something perceived as new to the potential adopter, even though it might be familiar to the rest of the world.

Rogers outlines five elements of diffusion: relative advantage, observability, compatibility, complexity, and trialability. The more of these elements present in any particular innovation, the more likely it will be adopted. The following questions and examples represent what potential technology users are considering when they decide to adopt new computer tools and instructional strategies.

1. *Relative Advantage.* Is the innovation better than what it replaces? What risk is involved? Is it worth the change? Initially, creating a multimedia presentation and figuring out how to project it to the entire class can take more preparation time than

a traditional lecture. When considering relative advantage, teachers may wonder if the effort of using technology is worth the work.

2. *Observability*: Are the results of the innovation visible to others? Can they see how it works and observe the consequences? If teachers see students producing more and higher-quality work when using the computer, then they will be more likely to adopt technology.
3. *Compatibility*: How consistent is the innovation with the values, past experiences, and needs of the potential adopters? Because the majority of current teachers are not products of technology-enriched preservice training programs, they often comment on the frustrations of using computers combined with new teaching methods.
4. *Complexity*: Is the innovation easy to understand, use, and maintain? Can it be explained to others? Initially, teachers make comments about the challenges of managing the new learning environment. However, as teachers move toward adoption, they anticipate potential problems and develop techniques for handling the challenges that occur as they and their students work with computers.
5. *Trialability*: Can the innovation be tried out on a limited basis? In other words, if we don't like it, can we ditch it? After a successful technology-integration experience, teachers are excited about trying more lessons using technology.

If teachers are to adopt technology, they must recognize and understand the five elements of diffusion as they relate to computers. Addressing educators' needs as they learn to use new innovations will help them move toward integration.

What Are the Stages of Technology Integration?

Technology cannot be integrated overnight. It can take years to complete the process. How will teachers know they have arrived if they are not familiar with signposts along the way? According to Sandholtz, Ringstaff, and Dwyer (1997), technology integration includes five stages: entry, adoption, adaptation, appropriation, and invention. Each stage has its own patterns of change and support requirements.

At the entry phase, teachers use primarily text-based materials. Instruction is traditional, with teacher-directed activities. Some common instructional technologies include blackboards, textbooks, workbooks, and overhead projectors. As they try to use computer technologies in the traditional environment, teachers typically encounter problems with discipline and resource management. Technical issues also

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plague users. The support needed for educators at the entry phase includes providing time for planning with peers and opportunities for staff to share experiences with nonparticipant colleagues.

When teachers move into the adoption phase, they begin to show more concern about how technology can be integrated into daily lesson plans. Traditional whole-group lecture and seat work still dominate instructional strategies. Nevertheless, technology is now being used to teach children how to use technology. Common activities include keyboarding, word-processing, or drill-and-practice activities. Teachers begin to anticipate problems and develop strategies to solve them. Although technical issues still exist, at this stage the teachers begin to perform basic troubleshooting on their equipment such as fixing paper jams or changing the ink cartridge in the printer (Sandholtz et al., 1997). Technical support and training for computer-assisted-instruction and word-processing software are necessary at this stage (Dwyer, Ringstaff, & Sandholtz, 1990).

At the next phase, adaptation to and integration of new technologies into traditional classroom practice occur. Lecture, seat work, and recitation continue to dominate classroom practice; however, during 30% to 40% of the school day, students use word processors, databases, some graphic programs, and computer-assisted-instruction packages (Sandholtz et al., 1997). Productivity is a major theme. Students produce more faster. Teachers have learned to use computers to save time rather than create additional demands. According to Dwyer et al. (1990), there are four support issues. First, encourage peer observation and team teaching, and develop a flexible schedule that permits these activities. Second, introduce and discuss alternative pedagogies. Third, because productivity is important at this stage, train staff to use such

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software tools as spreadsheets, databases, graphics, hypermedia, and e-mail. Fourth, introduce videodiscs and scanners.

Sandholtz et al. (1997) describe appropriation as more of a milestone than a phase. Personal appropriation of the technology tools by individual students and teachers is the catalyst to this change in technology use. Teachers' personal attitudes toward technology become the benchmark for this milestone in instructional evolution. Teachers understand technology's usefulness, and they apply it effortlessly as a tool to accomplish real work. More interactions between students are observed, and students work with computers frequently. There is evidence of project-based instruction, collaboration and cooperation, and creative schedules. At this milestone, encourage routine peer observations and group discussions. Discuss alternative assessments. Encourage professional growth through conferences and presentations. Finally, examine technology integration goals.

The pinnacle is the invention phase. Teachers experiment with new instructional patterns and ways of relating to students and other teachers. They reflect on teaching and question old patterns of instruction. Teachers begin to see knowledge as something children must construct rather than something to be transferred. Interdisciplinary project-based instruction, team teaching, and individually paced instruction are hallmarks of this phase. Classroom interactions change. Student experts surface to assist their peers and teachers with technology. Students work together in more collaborative ways. To support teachers at this level, advocate collaboration between teachers and encourage teachers to write about and publish their experiences. Create an ongoing support system with others outside the district through e-mail and the

Internet. Finally, integrators should share their knowledge by mentoring other teachers.

Conclusion

Addressing these four essential questions early on can help educators define their expectations for technology integration. Creating a common vision of what technology integration is and where it happens begins the journey down the integration path. Equally important are recognizing the barriers that will surface along the way and making plans to address the changes that will take place. Classrooms where students are fully engaged in meaningful learning using a variety of instructional technologies to meet their goals are electrifying. However, technology integration is a growth process. It takes time. Making educators aware of the answers to these questions could be a crucial step toward using computers effectively in education.

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